

WHAT IS CLAIMED IS:

- 1 1. An infrared imaging apparatus, comprising:
2 a dewar, having an internal volume that defines a cold space;
3 an IR transmissive window that seals the cold space to receive IR
4 energy directly from an IR source;
5 a first lens located within the cold space to receive IR energy directly
6 from the IR transmissive window;
7 an IR detector located within the cold space in operational
8 communication with the first lens and positioned coincident to the focal plane of at
9 least a first and second wavelength of IR energy; and
10 an optical stop located within the cold space in front of the single
11 lens.
- 1 2. The infrared imaging apparatus of claim 1, wherein the single lens
2 has a first aspheric profile on a first side and a second aspheric profile on a second
3 side, the first side parallel to the second side and the second side facing the
4 detector.
- 1 3. The infrared imaging apparatus of claim 2, wherein the second
2 aspheric profile has a holographic optical element.
- 1 4. The infrared imaging apparatus of claim 3, wherein the holographic
2 optical element color corrects at least one color band of infrared energy.
- 1 5. The infrared imaging apparatus of claim 4, wherein the holographic
2 optical element color corrects a red MWIR band and a blue MWIR band.

1 6. The infrared imaging apparatus of claim 1, wherein the detector is a
2 hyperspectral detector.

1 7. The infrared imaging apparatus of claim 1, wherein the detector
2 detects at least three wavelengths of IR energy including at least one LWIR band
3 of energy.

1 8. The infrared imaging apparatus of claim 1, wherein the LWIR band
2 of energy is preferably an indigo LWIR band.

1 9. The infrared imaging apparatus of claim 1, wherein the holographic
2 optical element coincidently focuses a MWIR band and a LWIR band of IR energy
3 at a common focal plane.

1 10. The infrared imaging apparatus of claim 1, wherein the second
2 wavelength of IR energy is a harmonic component of the first wavelength.

1 11. The infrared imaging apparatus of claim 1, wherein the single lens is
2 made of germanium.

1 13. The infrared imaging apparatus of claim 1, wherein the single lens is
2 made of silicon.

1 14. The infrared imaging apparatus of claim 1, wherein the apparatus
2 performs at an F-stop (F/#) of at least 1.4 with a square field of view of 90x90
3 degrees.

1 15. The infrared imaging apparatus of claim 1, wherein the detector
2 concurrently collects radiation from multiple, adjacent spectral radiation bands.

1 16. The infrared imaging apparatus of claim 3, wherein the first aspheric
2 surface has the following prescription:

3 radius = -0.94467;
4 k = 28.345216;
5 a = -2.13952;
6 b = -69.5274;
7 c = 2342.04;
8 d = -56841.9; and
9 first surface thickness = 0.548467.

1 17. The infrared imaging apparatus of claim 16, wherein the second
2 aspheric surface has the following prescription:

3 radius = -0.61281;
4 k = 0.1399;
5 a = 0.033459;
6 b = -2.3598;
7 c = 10.889;
8 d = -36.331; and
9 second surface thickness = 0.462731.

1 18. The infrared imaging apparatus of claim 17, wherein the holographic
2 optical element has the following prescription:

3 -0.0051393, -0.10212, 0.91035, -2.3946.

1 19. The infrared imaging apparatus of claim 3, wherein the first aspheric
2 surface has the following prescription:

3 radius = -1.23508;
4 k = 36.049455;
5 a = -1.69104;
6 b = -98.6413;
7 c = 5589.83;
8 d = -162359; and
9 first surface thickness = 0.761661.

1 20. The infrared imaging apparatus of claim 19, wherein the second
2 aspheric surface has the following prescription:

3 radius = -0.81270;
4 k = -0.10748;
5 a = 0.054475;
6 b = -0.72423;
7 c = 2.9155;
8 d = -7.8939; and
9 second surface thickness = 0.480234.

1 21. The infrared imaging apparatus of claim 20, wherein the holographic
2 optical element has the following prescription:

3 -0.017112, -0.038991, 0.55069, -1.6405.